

Short Answer:

Answer the following questions with complete sentences in your own words. You are encouraged to conduct your own research online or through other methods before answering the questions. If you research online, please consult multiple sources before you write down your answers. You are expected to be able to explain your answers in detail (Provide examples for each question).

1. Explain CLR and its execution process
2. What are C# variables and how to declare C# variables?
3. What are value types? Give some examples of predefined value types in C#.
4. Give examples for reference types and what is the difference between value type and reference type.
5. What is immutable? Is string immutable or mutable?
6. What is the string intern pool in C# and why do we need the intern pool?

List some ways to Concatenate Strings In C#

7. What is meant by casting a data type? What are the 2 kinds of data type conversions available in C#?
8. Will the following code compile? Why ?

```
double myDouble = 11.11;  
int myInt = myDouble;
```

9. What is the **dynamic** type? How does it differ from **var**?
10. What is the nullable value type?
11. What are the results of the following expressions? Please include the calculation process. (logical operator)

```
1)    5 & 6  
2)    5 | 6  
3)    5 ^ 6
```

12. Why do we need to use the break statement in the Switch statement?

13. What are access modifiers and their corresponding scopes in C#?

14. Can you specify an access modifier for enumeration members?

15. What is assembly?

Coding Questions:

Write code in C# to solve the following problems. Please write your own answers. You are highly encouraged to present more than one way to answer the questions. Please follow best practices when you write the code so that it is easily readable, maintainable, and efficient. Clearly state your assumptions if you have any. You may discuss with others on the questions, but please write your own code.

1. Develop a mathematical Calculator

a. (2 Variables -- X=5,Y=7) -->> Add, Sub, Mul, Div

b. (3 Variables -- X=5,Y=6,Z=7) -->> Add, Sub, Mul, Div

The input contains two arrays, an array of variables and an array of operators:

input1 = [5,6,14,7], input2 = ["Add", "Sub", "Div"]

The precedence of operator needs to be taken care of, for example, the above example should be $5 + 6 - (14 / 7) = 9$ instead of $(5 + 6 - 14) / 7 = 0$ (if the end result is not an integer, output the floor of the decimal result)

Assumption:

1. No parentheses
2. Input will always be valid
3. `input2.length = input1.length - 1`

2. Write a C# program to convert minutes into a number of years and days.

Test Data

Input the number of minutes: 3456789
Expected

```
Output : 3456789 minutes is approximately 6 years and 210 days
```

3. Using only the programming techniques you learned in this lesson, write an application that calculates the squares and cubes of the numbers from 0 to 10 and prints the resulting values in a table format, as shown below. (Build-in functions are not acceptable) number square cube

```
og    sq    cube
0      0      0
1      1      1
2      4      8
. . .
10    100   1000
```

4. (Print a table) Write a program that displays the following table:

```
a      b      pow(a, b)
1      2      1
2      3      8
3      4      81
4      5      1024
5      6      15625
```

5. (Occurrence of max numbers) Write a program that reads integers, finds the largest of them, and counts its occurrences. Assume that the input ends with the number 0. Suppose that you entered 3 5 2 5 5 5 0; the program finds that the largest is 5 and the occurrence count for 5 is 4.

```
Enter numbers: 3 5 2 5 5 5 0
```

```
The largest number is 5
```

```
The occurrence count of the largest number is 4
```

6. Given a non-empty array of integer nums, every element appears twice except for one. Find that single one. Could you implement a solution with a linear runtime complexity without using extra memory? (Hint: xor)

```
Input: nums = [2,2,1]
Output: 1
Input: nums = [4,1,2,1,2]
Output: 4
```

7. PrintNumberInWord (nested-if, switch-case): Write a program called PrintNumberInWord which prints "ONE", "TWO", ..., "NINE", "OTHER" if the int variable "number" is 1, 2, ..., 9, or other, respectively.

Write the code in two ways:

```
(a) a "nested-if" statement;
(b) a "switch-case" statement.
```

8. Convert an array of char to an array of int.

```
Input: ['1', '2', '4', '6', '8']
Output: [1, 2, 4, 6, 8]
```

9. Practice on String Concatenation. Write examples for:

```
(1) + operator
(2) string interpolation
(3) string.Concat
(4) String.Format
(5) String.Join
(6) StringBuilder.Append
```